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(71) Applicant and
(72) Inventor: WONG, Keith, K. [US/US]; 6348 East Doubltree Ranch Road, Paradise Valley, AZ 85253 (US).

(74) Agents: GRESHAM, Lowell, W. et al.; Meschkow & Gresham, P.L.C., Suite 409, 5727 North Seventh Street, Phoenix, AZ 85014 (US).

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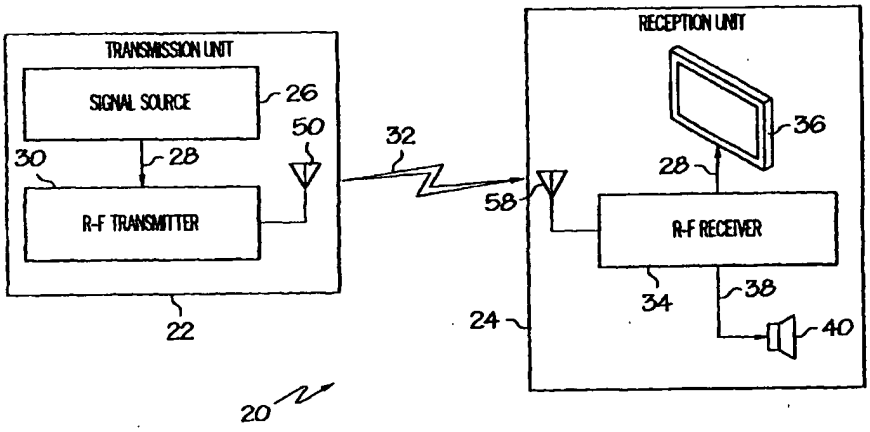
(54) Title: SOFT-MOUNTED, TRANSPORTABLE, AUDIOVISUAL SYSTEM



(57) Abstract: A soft-mounted, transportable, audiovisual system (20) is provided. A transmission unit (22) has a signal source (26) configured to produce a video signal (28). The transmission unit (22) also has a radio-frequency transmitter (30) configured to modulate and transmit a wireless radio-frequency signal (32) modulated with the video signal (28). A reception unit (24) has a radio-frequency receiver (34) configured to receive and demodulate the wireless radio-frequency signal (32) to produce the video signal (28) contained therein. The reception unit (24) also has a flat-panel video display unit (36) configured to display the video signal (28). A strap (66) affixed to a headrest (52) of a first seat (44) encircles the headrest (52) to soft-mount the reception unit (24) so that the video display unit (36) faces towards a viewing individual (54) seated in a second seat (46) positioned behind the first seat (44). An adjusting device (92) determines an attitude of the video display unit (36) by adjusting a distance (98) between the headrest (52) and an edge (100, 104) of the video display unit (36).

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SOFT-MOUNTED, TRANSPORTABLE, AUDIOVISUAL SYSTEM

TECHNICAL FIELD

The present invention relates to the field of audiovisual systems. More specifically the present invention relates to the field of transportable wireless audiovisual systems.

BACKGROUND ART

Video systems have long been used to convey information and/or provide entertainment in homes, offices, and schools. Recently such systems have been adapted for use in moving vehicles. Typically, the video displays of such systems are mounted so as not to distract the driver of the vehicle. That is, the display units of video systems in moving vehicles are typically mounted so as to be visible to passengers in a rear seat only.

Conventionally, a video system is hard-mounted into a vehicle. That is, the system is installed by using screws, brackets, wiring, and other mounting devices requiring that the vehicle be modified by drilling, cutting, tunneling, etc. Such modification is undesirable in that it increases the difficulty of installation. Many such installations require the services of a professional installer in order to maintain a "factory-installed" appearance. This creates a significant increase in overall system cost.

In addition, by modifying the vehicle, the video system becomes a part of the vehicle. Therefore, when the vehicle is to be sold, either the video system remains with the vehicle and is lost to the user, or the video system is removed, exposing the modifications and reducing the value of the vehicle.

Additionally, such a video system, by being hard-mounted and, therefore, a part of the vehicle, is not readily transportable. That is, the system cannot be easily removed from one vehicle and installed into another. This poses a significant problem where multiple-vehicle use is desired.

In those few currently available video systems which are capable of being soft-mounted into a vehicle, hence transportable from one vehicle to another, the wiring used to provide power to the system components and, in some cases, to carry the video signal between components of the system pose a problem with both aesthetics and safety. That

is, it is unsightly to have loose wiring draped around the interior of a vehicle. Such wiring may become entangled with the vehicle's controls (e.g., the gearshift or pedals) and interfere with safe operation of the vehicle. Such wiring may also become entangled with the passengers (especially children) and pose a safety hazard thereto.

Another problem exists with conventional vehicular audiovisual systems in that the attitude and location of the video display is typically such that viewing is difficult and/or uncomfortable. For example, when a console-mounted display is used in a van, the low position of the display makes viewing by passengers in a third seat difficult or impossible when the passenger is safely secured by his/her seat belt. Ceiling-mounted displays, on the other hand, require passengers in the second seat to crane their necks uncomfortably. Even in those few existing systems having a display mounted at an appropriate height, a problem exists in adjusting the attitude of the display to minimize eyestrain and other discomfort of the viewer.

A secondary problem exists with ceiling-mounted displays in that, when in use, the displays often interfere with the image in the driver's rear-view mirror, thus creating a safety risk.

Conventional vehicular video systems also presume a single video system per vehicle. This is not always desirable, as when one viewer wishes to watch a movie while another viewer wishes to play a video game. This can lead to conflict well understood by any parent of two or more children.

The ability to have more than one video system per vehicle leads naturally to the concept of a plurality of video systems in a multi-passenger vehicle, e.g., an airplane, train, or bus, or in a non-vehicular area, e.g., a classroom, testing facility, or workplace, where each video system is capable of displaying an independent program.

DISCLOSURE OF INVENTION

Accordingly, it is an advantage of the present invention that a soft-mounted, transportable, audiovisual system is provided.

It is another advantage of the present invention that an audiovisual system is provided where a reception unit is wirelessly coupled to a transmission unit via a radio-frequency signal.

It is another advantage of the present invention that an audiovisual system is provided having a battery-operated reception unit.

It is another advantage of the present invention that an audiovisual system is provided where a reception unit is soft-mounted to a seatback or headrest requiring no changes or modifications to the seatback or headrest.

It is another advantage of the present invention that an audiovisual system is provided where a video display is mounted to a seatback or headrest, thus providing a convenient and appropriate height for viewing by the greatest number of passengers.

It is another advantage of the present invention that an audiovisual system is provided where a video display unit has a device for controlling the attitude of the video display.

It is another advantage of the present invention that multiple independent audiovisual systems may be used in close proximity to one another.

The above and other advantages of the present invention are carried out in one form by a soft-mounted, transportable, wireless audiovisual system having a transmission unit with a signal source configured to produce a video signal and with a radio-frequency transmitter coupled to the signal source and configured to transmit a wireless radio-frequency signal modulated with the video signal, having a reception unit with a radio-frequency receiver radiatively coupled to the transmission unit and configured to receive and demodulate the wireless radio-frequency signal to produce the video signal contained therein, and with a flat-panel video display unit coupled to the radio-frequency receiver and configured to display the video signal, and having an attachment apparatus coupled to the reception unit and configured to soft-mount the reception unit to a mounting object.

BRIEF DESCRIPTION OF DRAWINGS

A more complete understanding of the present invention may be derived by referring to the detailed description and claims when considered in connection with the Figures, wherein like reference numbers refer to similar items throughout the Figures, and:

FIG. 1 shows a schematic block diagram of a wireless audiovisual system in accordance with a preferred embodiment of the present invention;

FIG. 2 shows a side view depicting a wireless audiovisual system in operation in accordance with a preferred embodiment of the present invention;

FIG. 3 shows a side view depicting a horizontal strap mounting a reception unit to a seat headrest in accordance with a preferred embodiment of the present invention;

FIG. 4 shows a side view depicting a vertical strap mounting a reception unit to a seat headrest in accordance with a preferred embodiment of the present invention;

FIG. 5 shows a back view of a reception unit depicting alternative strap mounts in accordance with a preferred embodiment of the present invention;

FIG. 6 shows a side view depicting a hood mounting a reception unit to a seat having an integral headrest in accordance with a preferred embodiment of the present invention; and

FIG. 7 shows a side view depicting a sleeve mounting a reception unit to a seatback in accordance with a preferred embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

FIG. 1 shows a schematic block diagram depicting the electrical relationships of the components of a wireless audiovisual system 20 in accordance with a preferred embodiment of the present invention.

System 20 has a transmission unit 22 and a reception unit 24. Transmission unit 22 incorporates a signal source 26 configured to provide an appropriate video signal 28. In the preferred embodiment, video signal 28 is a standard National Television Standards Committee (NTSC) or Phase Alternate Line (PAL) composite television signal. Those skilled in the art will appreciate that other types of video signals may be used for specialized systems without departing from the spirit of the present invention.

In the preferred embodiment, signal source 26 may be a videotape or videodisk player, a digital versatile disk (DVD) player, a television tuner, a video-game player, a computer, or any other device capable of producing video signal 28.

Transmission unit 22 also incorporates a radio-frequency (r-f) transmitter 30 configured to produce a carrier signal (not shown), modulate the carrier signal with

video signal 28, and transmit the modulated carrier signal as a wireless r-f signal 32. In the preferred embodiment, r-f signal 32 has a nominal carrier frequency of 900 MHz. Those skilled in the art will appreciate that various carrier frequencies and various forms of modulation may be used without departing from the spirit of the present invention.

Reception unit 24 incorporates an r-f receiver 34 configured to receive and demodulate wireless r-f signal 32 to produce video signal 28. Demodulated video signal 28 is then passed to a flat-panel video display unit (VDU) 36, i.e., a thin display screen as used in portable computers and other electronic devices, typically using a Liquid Crystal Display (LCD) technology. Optionally, r-f receiver 34 may extract and amplify an audio signal 38 from video signal 28 and route audio signal 38 to a speaker 40 or headphones (not shown). Alternatively, r-f transmitter 30 may also transmit an independent audio-modulated r-f signal (not shown) to a separate receiver in the vehicle, such as a radio.

Those skilled in the art will appreciate that the above scenario is exemplary and that variations in detail from the methodology described do not depart from the spirit of the present invention.

FIG. 2 shows a schematic side view depicting wireless audiovisual system 20 in operation in accordance with a preferred embodiment of the present invention. The following discussion refers to FIGs. 1 and 2.

Wireless audiovisual system 20 is shown installed in a vehicle 42 having a first (front) seat 44, a second (rear) seat 46, and a third (rearmost) seat 48. Transmission unit 22 is shown located on the floor of vehicle 42 behind rearmost seat 50. Those skilled in the art will appreciate that transmission unit 22 may be located anywhere desired within vehicle 42.

In the preferred embodiment, transmission unit 22 incorporates signal source 26 and has a significant power requirement. Transmission unit 22 is therefore connected to a source of vehicular power (not shown) such as a 12-volt accessory outlet. This is not a requirement of the present invention, and a fully portable, battery-operated version of transmission unit 22 may easily be realized.

Reception unit 24 is shown mounted to a headrest 52 of front seat 44. In this position, VDU 36 may easily be viewed by a viewing individual (passenger) 54 in either rear seat 46 or rearmost seat 48. At the same time, VDU 36 is not in a position where it

may be a distraction to a driver 56 in front seat 44. The location of VDU 36, therefore does not pose a danger to the operation of vehicle 42.

Reception unit 24 is fully battery powered and self contained. Therefore, no wires of any type are required for operation of reception unit 24.

As shown in FIG. 1, r-f signal 32 is transmitted by transmitter 30 in transmission unit 22 via transmission antenna 50 and received by receiver 34 of reception unit 24 via reception antenna 58. In the preferred embodiment, antennas 50 and 58 are incorporated into the cases of transmission unit 22 and reception unit 24, and are therefore not visible in FIGs. 2 through 7. This is not a requirement of the present invention, however, and those skilled in the art will appreciate that other forms of antennas 50 and 58, as well as other methods of propagating r-f signal 32 from transmission unit 22 to reception unit 24, may be utilized without departing from the spirit of the present invention.

FIGs. 3, 4, 6 and 7 depict various forms of an attachment apparatus 60 used to mount reception unit 24 to a mounting object 62, while FIG. 5, shows a back view of reception unit 24 depicting selectable horizontal and vertical mounts 64 for straps 66 in accordance with preferred embodiments of the present invention. The following discussion refers to FIGs. 1 through 7.

In FIGs. 3 and 4, apparatus 60 consists of straps 66 mounting reception unit 24 to headrest 52 of front seat 44. In FIG. 3, straps 66 are used in substantially horizontal planes 68, whereas in FIG. 4, straps 66 are used in substantially vertical planes 70. In the preferred embodiment, straps 66 are attached to a back side 72 of reception unit 24. As shown in FIG. 5, attachment clips 74 are inserted into crossed slots 76 so as to allow passage of straps 46 under clips 74 in either horizontal plane 48 or vertical plane 52. Straps 46 pass around headrest 50 (FIGs. 3 and 4) and are retained in position by either a hook and loop fastener 78 or a buckle (not shown). Desirably, a portion 80 of each strap 46 is fabricated of an elastic material to provide a continuing tension to straps 46 while allowing for attitude adjustment of VDU 36 (discussed below).

Whether it is more desirable to use straps 46 in horizontal planes 68 or vertical planes 70 is dependent upon the shape and size of headrest 52. For a tall or relatively flat version of headrest 52, a horizontal use of straps 46 is suggested. Conversely, for a short

or relatively deeply contoured version of headrest 52, a vertical use of straps 46 is suggested.

Similarly, the separateness and presence of headrest 52 also influences the use of straps 46. If headrest 52 is integrated into a seatback 82 of front seat 44 (i.e., front seat 44 has a one-piece seatback and headrest), then a horizontal use of straps 46 around integrated headrest 52 is suggested. Alternatively, if front seat 44 has no headrest 52, then a vertical use of straps 46 around seatback 82 is suggested.

Those skilled in the art will appreciate that while the preferred embodiments of FIGs. 3 and 4 each have a pair of straps 46 in substantially parallel planes, this is not a requirement of the present invention. Other numbers and/or combinations of straps 46 may be used without departing from the spirit of the present invention.

In FIG. 6, apparatus 60 consists of a hood 84 mounting reception unit 24 to an integral headrest 52 and seatback 82 of front seat 44. In the preferred embodiment of FIG. 6, a portion 86 (up to the whole) of hood 84 is fabricated of an elastic or conformable material, such as spandex. This assures a snug fit.

In FIG. 7, apparatus 60 consists of a sleeve 88 mounting reception unit 24 to seatback 82 of front seat 44. Sleeve 88 is desirable when the shape or angle of headrest 52 is such as to inhibit effective mounting reception unit 24 thereto. For example, when a back side of headrest 52 slopes at such an angle that it would not be possible to position VDU 36 at a comfortable viewing angle. Being essentially a tube, sleeve 88 may be passed over headrest 52 to attach to seatback 82. Like hood 84 discussed above, a portion 90 (up to the whole) of sleeve 88 is desirably fabricated of an elastic material to assure a snug fit.

Those skilled in the art will appreciate that reception unit 24 and mounting apparatus 60 together form a fully transportable, soft-mounted viewing assembly 91. While straps 66, hood 84, and sleeve 88 are described herein as preferred embodiments of attachment apparatus 60, other embodiments of attachment apparatus 60 may be used without departing from the spirit of the present invention.

It will also be appreciated that reception unit 24 is soft-mounted. That is, the mounting of reception unit 24 to mounting object 62 requires no modification of mounting object 62. Therefore, attachment apparatus 60 detachably mounts reception

unit 24 to mounting object 62. Furthermore, mounting object is in a preexisting condition prior to the mounting of reception unit 24, maintains that preexisting condition while reception unit 24 is mounted, and retains that preexisting condition after reception unit 24 is dismounted.

Referring to FIGs. 3, 4, 6, and 7, it may be seen that attitude adjusting device 92 allows the attitude of VDU 36 to be varied until a desired viewing position is reached. In the preferred embodiments shown in the Figures, reception unit 24 is divided into two portions. A first or upper portion 94 contains VDU 36 and attaches to attachment apparatus 60. A second or lower portion 96 is pivotally attached to upper portion 94 and serves as adjusting device 92. By pivoting lower portion 96 towards headrest 52 or seatback 82, a distance 98 between a lower (bottom) edge 100 of VDU 36 may be increased. Additionally, depending upon the specific shape of headrest 52 or seatback 82, a distance 102 between an upper (top) edge 104 of VDU 36 may be decreased.

As demonstrated in the preferred embodiment of FIG. 5, the hinged lower portion 96 of reception unit 24 is a desirable location for r-f receiver 34, a battery (or batteries) 106 to provide internal power for reception unit 24, and/or a storage space for a power cord 108 to provide external power for reception unit 24 in the event of a failure of battery 106 or otherwise desired.

It should be noted that when not used in a vehicular or similar environment, i.e., when reception unit 24 is not coupled to mounting object 62, adjusting device 92 may be pivoted to slightly greater than 90° (not shown) and thus serve as a stand for VDU 36.

Those skilled in the art will appreciate that the preferred embodiment of adjusting device 92 described herein is exemplary. Other embodiments of adjusting device 92 may be used without departing from the spirit of the present invention.

Since transmission unit 22 is radiatively coupled to reception unit 24, one transmission unit 22 may transmit r-f signal 32 to any number of reception units 24. Also, because transmission unit 22 transmits r-f signal 32 at a specific frequency (approximately 900 MHz in the preferred embodiment), other proximate transmission units 22 may transmit other r-f signals 32 at other frequencies, i.e., over other "channels." This allows the use of frequency-selectable reception units 24 that may choose a desired program by selecting a specific r-f signal from one of a plurality of

transmission units 22. Such a system is ideal for multi-passenger vehicles, such as busses, where each passenger may independently choose any of a plurality of programs.

In summary, the present invention teaches a soft-mounted, transportable, audiovisual system 20. System 20 has a reception unit 24 wirelessly coupled to a transmission unit 22 via a radio-frequency signal 32. Reception unit 24 is battery-operated. Reception unit 24 is soft-mounted to a mounting object 62, e.g., a seatback 82 or headrest 52, requiring no changes or modifications to mounting object 62. Reception unit 24 has a flat-panel video display unit 36 mounted to mounting object 62 at a convenient and appropriate height for viewing by the greatest number of viewing individuals 54. Reception unit 24 has an adjusting device 92 for controlling a viewing attitude of video display unit 36. Multiple independent audiovisual systems 20 may be used in close proximity to one another.

Although the preferred embodiments of the invention have been illustrated and described in detail, it will be readily apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

CLAIMS

What is claimed is:

1. A soft-mounted, transportable, wireless audiovisual system (20) comprising:

a transmission unit (22), wherein said transmission unit (22) has a signal source (26) configured to produce a video signal (28), and wherein said transmission unit (22) additionally has a radio-frequency transmitter (30) coupled to said signal source (26) and configured to transmit a wireless radio-frequency signal (32) modulated with said video signal (28);

a reception unit (24), wherein said reception unit (24) has a radio-frequency receiver (34) radiatively coupled to said transmission unit (22) and configured to receive and demodulate said wireless radio-frequency signal (32) to produce said video signal (28) contained therein, and wherein said reception unit (24) additionally has a flat-panel video display unit (36) coupled to said radio-frequency receiver (34) and configured to display said video signal (28); and

an attachment apparatus (60) coupled to said reception unit (24) and configured to soft-mount said reception unit (24) to a mounting object (62).

2. An audiovisual system (20) as claimed in claim 1 wherein said attachment apparatus (60) is configured to dismountably soft-mount said reception unit (24) to said mounting object (62) such that:

said mounting object (62) is in a preexisting condition prior to mounting said reception unit (24);

said mounting object (62) substantially maintains said preexisting condition while said reception unit (24) is mounted thereto; and

said mounting object (62) substantially retains said preexisting condition after dismounting said reception unit (24).

3. An audiovisual system (20) as claimed in claim 1 wherein:

said mounting object (62) is a portion of a first seat (44); and

said attachment apparatus (60) is configured to soft-mount said reception unit (24) to said first-seat portion (62) so that said video display unit (36) faces towards a viewing individual (54) seated in a second seat (46) positioned behind said first seat (44).

4. An audiovisual system (20) as claimed in claim 3 wherein:

said first-seat portion (62) is a seatback (82) of said first seat (44); and

said attachment apparatus (60) is configured to soft-mount said reception unit (24) to said seatback (82).

5. An audiovisual system (20) as claimed in claim 3 wherein:

said first-seat portion (62) is a headrest (52) of said first seat (44); and

said attachment apparatus (60) is configured to soft-mount said reception unit (24) to said headrest (52).

6. An audiovisual system (20) as claimed in claim 1 wherein:

said attachment apparatus (60) comprises a strap (66) affixed to said reception unit (24) in one of a substantially horizontal plane (68) and a substantially vertical plane (70); and

said strap (66) is configured to soft-mount said reception unit (24) to said mounting object (62) and maintain said video display unit (36) in a desired position by encircling a portion of said mounting object (62) with said strap (66) in substantially said one plane (68,70).

7. An audiovisual system (20) as claimed in claim 1 wherein:

said attachment apparatus (60) comprises a hood (84) affixed to said reception unit (24), wherein at least a portion (86) of said hood (84) is fabricated of one of an elastic material and a conformable material; and

said hood (84) is configured to soft-mount said reception unit (24) to said mounting object (62) and maintain said video display unit (36) in a desired position by enshrouding a portion of said mounting object (62).

8. An audiovisual system (20) as claimed in claim 1 wherein said reception unit (24) incorporates a device (92) for adjusting a distance (102,98) between said mounting object (62) and one of a top edge (104) and a bottom edge (100) of said video display unit (36).

9. A soft-mounted viewing assembly (91) for a transportable audiovisual system (20) utilizing a wireless radio-frequency signal (32) modulated with a video signal (28), said viewing assembly (91) comprising:

a reception unit (24), wherein said reception unit (24) has a radio-frequency receiver (34) configured to receive and demodulate said wireless radio-frequency signal (32) to produce said video signal (28) contained therein, wherein said reception unit (24) additionally has a flat-panel video display unit (36) coupled to said radio-frequency receiver (34) and configured to display said video signal (28), and wherein said reception unit (24) additionally has an adjusting device (92) configured to adjust an attitude of said video display unit (36); and

an attachment apparatus (60) coupled to said reception unit (24) and configured to soft-mount said reception unit (24) to a mounting object (62).

10. A viewing assembly (91) as claimed in claim 9 wherein said attachment apparatus (60) comprises a strap (66) affixed to said reception unit (24), configured to soft-mount said reception unit (24) to said mounting object (62), and configured to maintain said video display unit (36) in a desired position by encircling a portion of said mounting object (62).

11. A viewing assembly (91) as claimed in claim 10 wherein:

said strap (66) is affixed to said reception unit (24) in a substantially horizontal plane (68); and

said strap (66) encircles said mounting object portion in substantially said substantially horizontal plane (68).

12. A viewing assembly (91) as claimed in claim 10 wherein:

said strap (66) is affixed to said reception unit (24) in a substantially vertical plane (70); and

said strap (66) encircles said mounting object portion in substantially said substantially vertical plane (70).

13. A viewing assembly (91) as claimed in claim 10 wherein at least a portion (80) of said strap (66) is fabricated of an elastic material.

14. A viewing assembly (91) as claimed in claim 9 wherein:

said attachment apparatus (60) comprises a hood (84) affixed to said reception unit (24); and

said hood (84) is configured to soft-mount said reception unit (24) to said mounting object (62) and to maintain said video display unit (36) in a desired position by enshrouding a portion of said mounting object (62).

15. A viewing assembly (91) as claimed in claim 14 wherein at least a portion (86) of said hood (84) is fabricated of one of an elastic material and a conformable material.

16. A viewing assembly (91) as claimed in claim 9 wherein:

said attachment apparatus (60) comprises a sleeve (88) affixed to said reception unit (24); and

said sleeve (88) is configured to soft-mount said reception unit (24) to said mounting object (62) and to maintain said video display unit (36) in a desired position by enclosing a portion of said mounting object (62).

17. A viewing assembly (91) as claimed in claim 9 wherein:

said adjusting device (92) is configured to adjust a distance (98) between said mounting object (62) and a bottom edge (100) of said video display unit (36).

18. A viewing assembly (91) as claimed in claim 9 wherein said adjusting device (92) is a second portion (96) of said reception unit (24) hingedly coupled to a first portion (94) of said reception unit (24).

19. A viewing assembly (91) as claimed in claim 18 wherein:

said first portion (94) of said reception unit (24) incorporates said video display unit (36); and

said second portion (96) of said reception unit (24) incorporates at least one of:

said radio-frequency receiver (34);

a speaker (40);

a battery (106) configured to provide internal power for said reception unit (24); and

a power cable (108) configured to provide external power for said reception unit (24).

20. A soft-mounted, transportable, audiovisual system (20) utilizing a wireless radio-frequency signal (32) modulated with a video signal (28), said system (20) comprising:

a transmission unit (22) having a signal source (26) configured to produce said video signal (28), and having a radio-frequency transmitter (30) coupled to said signal source (26) and configured to modulate and transmit said wireless radio-frequency signal (32);

a reception unit (24) having a radio-frequency receiver (34) configured to receive and demodulate said wireless radio-frequency signal (32) to produce said video signal (28) contained therein, having a flat-panel video display unit (36) coupled to said radio-frequency receiver (34) and configured to display said video signal (28), and having an adjusting device (92) configured to adjust a distance (98) between a mounting object (62) and a bottom edge (100) of said video display unit (36), said adjusting device (92) being configured to incorporate at least one of:

said radio-frequency receiver (34);

a speaker (40);

a battery (106) configured to provide internal power for said reception unit (24); and

a power cable (108) configured to provide external power for said reception unit (24); and

a strap (66) coupled to said reception unit (24) in one of a substantially horizontal plane (68) and a substantially vertical plane (70) and configured to soft-mount said reception unit (24) to a portion of a first seat (44) by encircling said first-seat portion in substantially said one plane (68,70) so that said video display unit (36) faces towards a viewing individual (54) seated in a second seat (46) positioned behind said first seat (44).

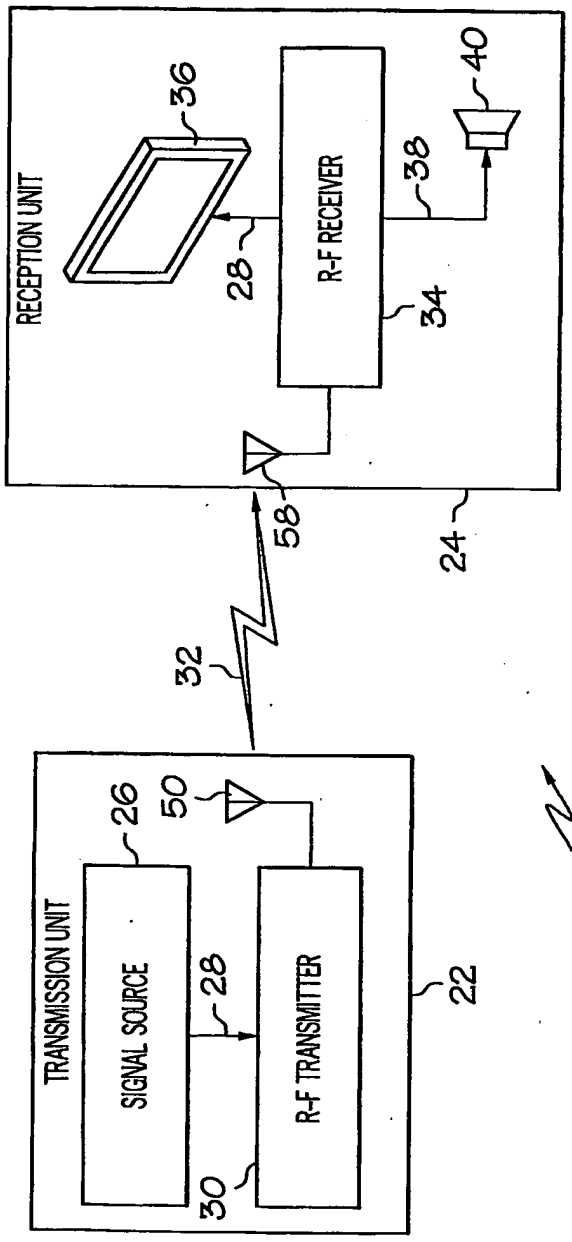

RECEPTION UNIT
36
40
38
R-F RECEIVER
28
34
58
24
32
TRANSMISSION UNIT
26
50
SIGNAL SOURCE
28
R-F TRANSMITTER
30
22
20

FIG. 1

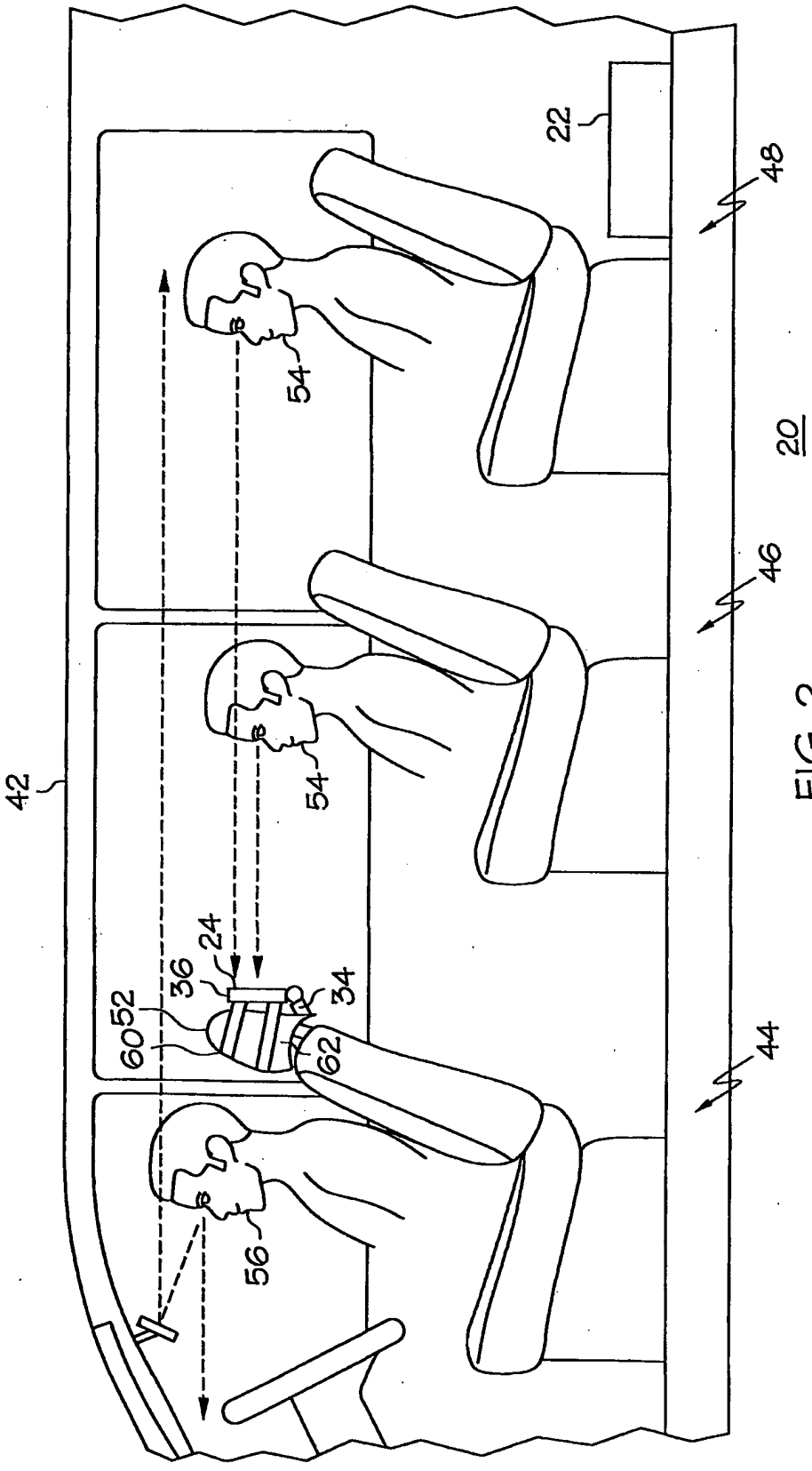


FIG. 2

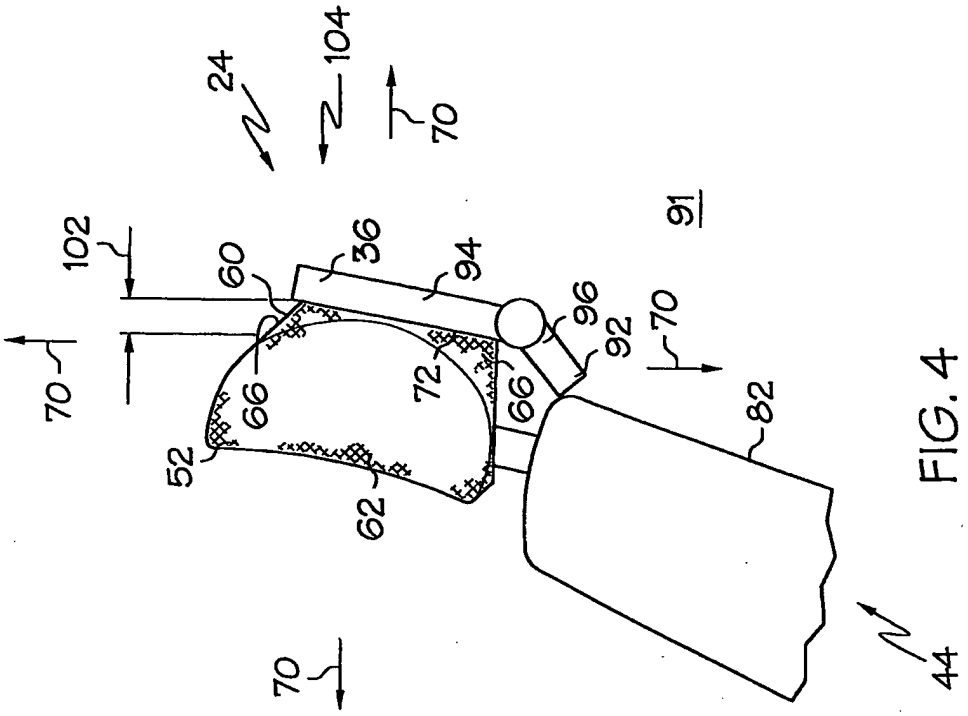
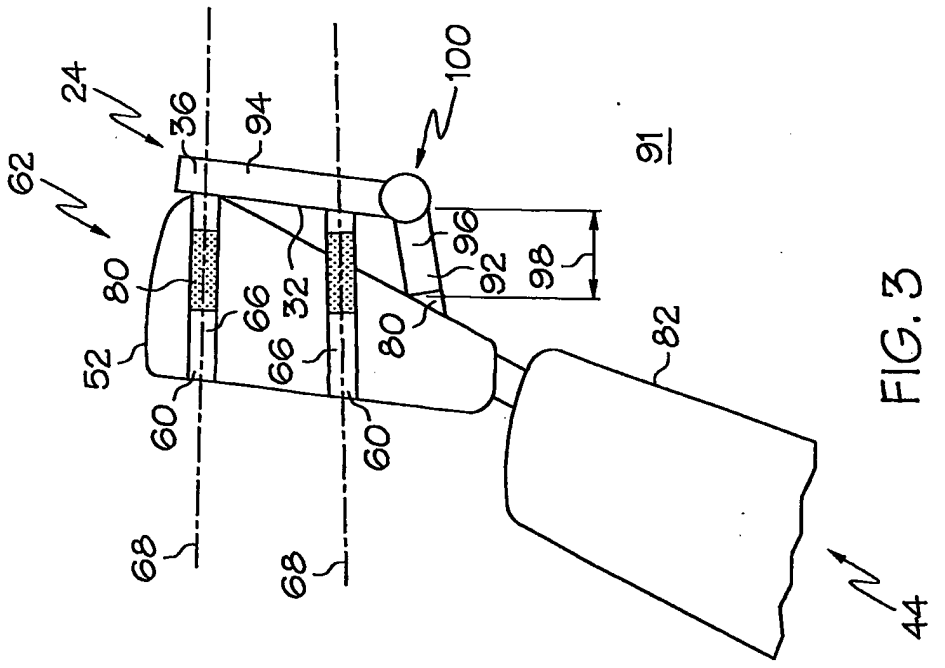

24
104
70
102
60
36
94
91
96
92
70
70
66
72
66
82
52
62
70
44

FIG. 4


24
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100
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62
96
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98
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32
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52
66
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68
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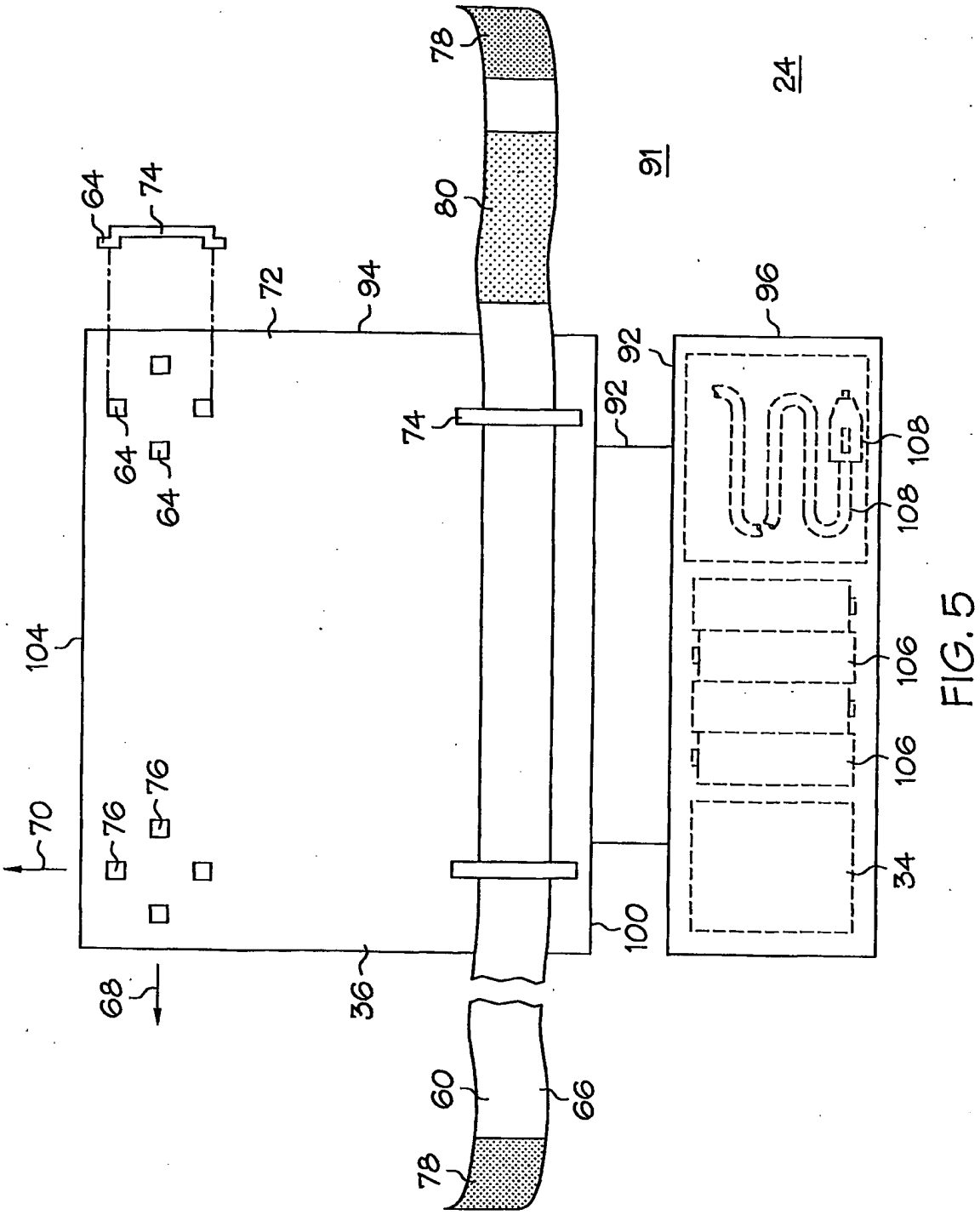
FIG. 3


78
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78

FIG. 5

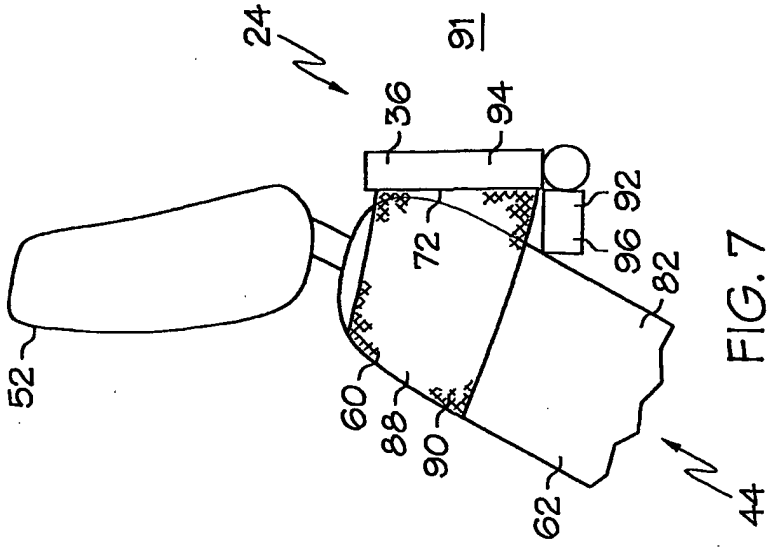
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FIG. 7

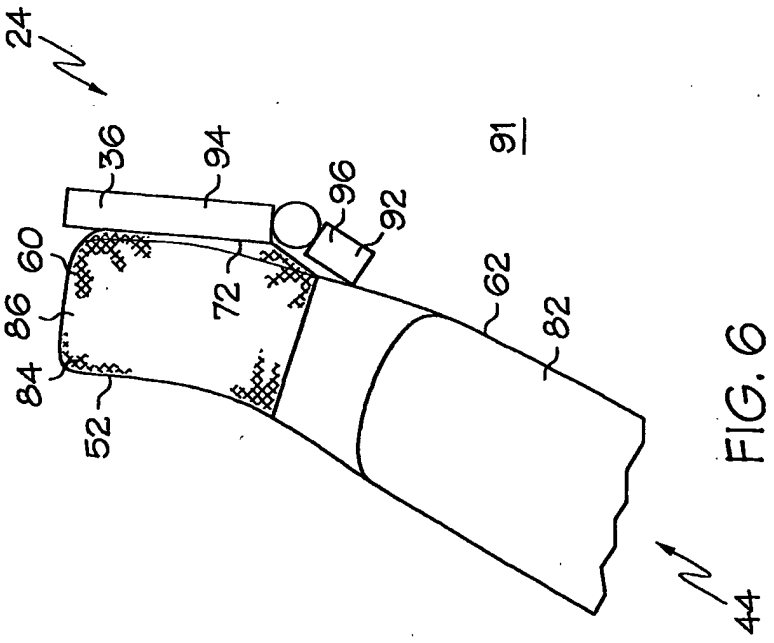
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FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/07973

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : H04N 7/14, 7/18
US CL : 348/14.01, 14.02, 14.03, 61, 64, 836; 725/75, 76, 77; 455/556
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 348/14.01, 14.02, 14.03, 61, 64, 836; 725/75, 76, 77; 455/556

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,073,033 A (CAMPO) 06 June 2000, col. 2, lines 38-44.	1-20
Y	US 5,893,037 A (REELE et al) 06 April 1999, col. 2, lines 10-26.	1-20
Y	US 5,825,408 A (YUYAMA et al) 20 October 1998, col. 1, lines 40-61.	1-20
Y	US 5,760,848 A (CHO) 02 June 1998, col. 2, lines 43-55.	1-20
Y	US 5,617,331 A (WAKAI et al) 01 April 1997, col. 3, lines 28-52.	1-20
Y	US 5,311,302 A (BERRY et al) 10 May 1994, col. 2, lines 7-32.	1-20

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 01 MAY 2001	Date of mailing of the international search report 22 MAY 2001
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GIMS S. PHILIPPE Telephone No. (703) 305-4700

Form PCT/ISA/210 (second sheet) (July 1998) ★

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/07973

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4,866,515 A (TAGAWA et al) 12 September, 1989, col. 3, lines 10-27.	1-20
Y	US 5,289,272 A (RABOWSKY et al) 22 February 1994, col. 2, lines 20-37.	1-20